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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/076,244

02/13/2002

Yakub Aliyu

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28112

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03/11/2004

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EXAMINER

BEREZNY, NEMA O

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 03/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/076,244	<b>Applicant(s)</b> ALIYU ET AL.	
	<b>Examiner</b> Nema O Berezny	<b>Art Unit</b> 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 20 January 2004.

2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) 1-30 is/are pending in the application.

4a) Of the above claim(s) 18-30 is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1-5 and 7-17 is/are rejected.

7) ☒ Claim(s) 6 is/are objected to.

8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on 13 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____
2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>06042002</u> .	6) <input type="checkbox"/> Other: _____

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PTOL-326 (Rev. 1-04)

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Part of Paper No./Mail Date 03012004

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election with traverse of claims 1-17 filed 1-20-04 is acknowledged. The traversal is on the ground(s) that any field of search would necessarily encompass searching all groups. This is not found persuasive. As stated in the restriction, for example, the claims of group I require a semiconductor device, whereas the remaining groups do not; group II requires a CVD deposition and group III requires a liquid deposition method, but group I does not have any deposition requirements; group IV requires a specific patterning method for nickel carbonyl, but the other groups do not. Therefore, searching all four groups would require a great deal more searching time than any one group alone.

The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 7-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the

invention. Independent claims 7 and 13 disclose forming a final passivation layer over said metal bump, and forming an opening within said final passivation layer, exposing said metal terminating pad. However, since the passivation layer is not formed over the terminating pad, then forming an opening in the passivation layer would not expose the terminating pad.

A preliminary search indicates that if line 4 of claims 7 and 13 was corrected to "forming a final passivation layer over said metal terminating pad", then said claims and their dependent claims would be allowable. A final search will be conducted if/when Applicant corrects said claims as noted above.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benenati et al. (6,177,729) in view of Estes et al. (6,410,415). Benenati discloses a method of bonding a chip to a substrate, comprising the steps of: providing a semiconductor chip (Figs.4a-4c el.26) having an exposed metal terminating pad (el.24) thereover, and a separate substrate having a corresponding exposed metal bump (el.20) thereover (col.2 lines 36-38); forming a conducting polymer plug (el.40a) over said exposed metal terminating pad; aligning said conducting polymer plug of said

semiconductor chip with said corresponding metal bump (Fig.4b); and adhering and permanently attaching said conducting polymer plug of said semiconductor chip with said corresponding metal bump of said separate substrate (Fig.5a). However, Benenati does not disclose forming a conforming interface layer, or copper terminating pads. Estes discloses forming a conforming interface layer (Fig.4 el.5) over said conducting polymer plug; mating said conforming interface layer over said conducting polymer plug with said corresponding metal bump (Fig.4); and thermally decomposing said conforming interface layer, adhering and permanently attaching said conducting polymer plug of said semiconductor chip with said corresponding metal bump of said separate substrate (col.10 lines 6-15, 57-65). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the conforming interface layer of Estes with the method of Benenati in order to eliminate the need for an additional underfill step (col.20 lines 43-50) **[claim 1]**.

Benenati also discloses wherein said exposed metal bump is comprised of copper (col.3 lines 42-49). Copper terminating pads are commonly used in the semiconductor industry because they have high electrical conductance and are solder wettable **[claim 3]**.

Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benenati in view of Estes as applied to claims 1 and 3 above, and further in view of Nuytkens (6,552,555). Benenati and Estes do not disclose a conducting polymer plug comprised of a material selected from the group consisting of doped polyacetylene, poly

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(para-phenylene vinylene) (PPV), and polyaniline, or a conducting polymer plug that is a material doped to degeneracy. However, Nuytkens discloses wherein said conducting polymer plug is comprised of a material selected from the group consisting of doped polyacetylene, poly (para-phenylene vinylene) (PPV), and polyaniline (col.2 lines 1-26) **[claim 4]**; and wherein said conducting polymer plug is a material doped to degeneracy (col.2 lines 1-4) **[claim 5]**. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the polymer plug material of Nuytkens with the method of Benenati and Estes in order to form flexible contacts that compensate for differences in height or shape (col.1 lines 52-55) – claim 4; and to form an elastic conductive polymer (col.7 lines 36-43) – claim 5.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Benenati et al. (6,177,729) in view of Estes et al. (6,410,415) as applied to claim 1 above.

Benenati in view of Estes do not disclose a conducting polymer plug from about 1000 to 10,000 Angstroms thick. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom.

Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

***Allowable Subject Matter***

The following is a statement of reasons for the indication of allowable subject matter for claim 6. The prior art of record does not teach or disclose or make obvious a method of bonding a chip to a substrate, comprising inter alia: a conforming interface layer comprising nickel carbonyl. The conforming interface layer of Estes is formed of thermoplastic or thermoset materials, which is very different in material and fabrication method than nickel carbonyl; Benenati is silent as to an interface material.

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nema O Berezny whose telephone number is (571) 272-1686. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NB



**JACK CHEN**  
**PRIMARY EXAMINER**